R E P O R T R E S U M E S

ED 020 685 EM 006 705

STUDY OF FEASIBILITY OF NEW EDUCATIONAL MEDIA FOR DEVELOPING COUNTRIES.

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PUB DATE 19 AUG 65

EDRS PRICE MF-$0.25 HC-$0.92 21P.

DESCRIPTORS- *PROGRAM COSTS, EDUCATIONAL FINANCE, *PURCHASING, *CAPITAL OUTLAY (FOR FIXED ASSESTS), *EDUCATIONAL EQUIPMENT, *PROGRAM BUDGETING, COST EFFECTIVENESS, COSTS, ESTIMATED COSTS, ACCOUNTING, INSTRUCTIONAL MEDIA, DEVELOPING NATIONS, DATA PROCESSING, EQUIPMENT MAINTENANCE, INSTRUCTIONAL INNOVATION,

COST DATA ON THE USE OF THE NEW INSTRUCTIONAL MEDIA ARE NECESSARY IN ORDER TO COMPARE DIFFERENT FORMS OF EDUCATION, TO DETERMINE THE ECONOMICALLY OPTIMUM RATE OF TECHNICAL USAGE, AND TO ASSIST ADMINISTRATORS. THE HISTORICAL INACCURACY OR STATISTICAL BIAS OF SOURCES AND THE INCOMPARABILITY OF DATA POSE DIFFICULTIES IN INTERPRETATION. THE COST OF EDUCATION, CALCULATED IN THE USUALLY IMPERFECT MARKETS OF DEVELOPING COUNTRIES, CAN BE BASED ON--CASH, BUDGET (FISCAL RESOURCES), MANPOWER, SKILLED MANPOWER, ALL CAPITAL RESOURCES, OR AVAILABILITY OF FOREIGN EXCHANGE FOR IMPORTED GOODS AND SERVICES. THESE COSTS SHOULD BE SO CATEGORIZED THAT THE SCARCEST RESOURCES ARE IDENTIFIED AND SAVED. WHEN COSTS ARE TABULATED, RATES OF EXCHANGE FROM EACH SET OF THESE COSTS INTO CASH SHOULD BE ESTABLISHED. THE NEW MEDIA HAVE COMMON COST CHARACTERISTICS THAT DIFFERENTIATE THEM FROM CONVENTIONAL EDUCATION COSTS. THESE ARE--INNOVATION, TRAINING, COURSE MATERIALS, EQUIPMENT FOR TRANSMISSION AND RECEPTION, AND RECURRENT COSTS. COSTING SHOULD BE CONSIDERED OVER A TOTAL TIME PERIOD, AND THUS ALSO DIVIDED INTO INITIAL, CAPITAL, AND RECURRENT COSTS. THE FINAL ANALYSIS SHOULD EXAMINE THE TREND OF COSTS, JOINT COSTS, AND BENEFITS OF THE NEW MEDIA. AN APPENDIX PRESENTS A COST CHART AND A LIST OF GUIDELINES. (JO)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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ED020685

INTERNATIONAL INSTITUTE FOR EDUCATIONAL PLANNING

Study of Feasibility of New Educational Media for Developing Countries

19 August, 1965

TO: Mr. Schramm
Mr. Lyle
Mr. Coombs

FROM: J. Vaizey

SUBJECT: A basic paper on the cost implications and economic aspects of the new media

I. SOME PRELIMINARY POINTS COVERING THE DIFFICULTY OF INTERPRETING DATA

(1) A caution as to sources

1. At the outset of this memorandum attention has to be drawn to certain basic principles of scholarship: any scholar or researcher needs to evaluate his sources. Let us suppose that a historian finds a document dated August 22, 1821, saying that Napoleon died on August 21, 1821. He has to ask himself for what purpose was this document written. Is it a forgery? Was the document really written in 1821? Let us suppose it is. The likelihood is that the information was truthful in the eyes of the sender. But the man who wrote it may have been mistaken. He may in his agitation have got the date or the year wrong. More significantly, he may have reported a rumour which was subsequently shown to be untrue. His purpose, however, may not have been an innocent one. He may have had an interest in

lying. The death of Napoleon might, perhaps, have caused a stock market boom, and the writer may have wished to be able to sell his securities on a rising market. That much for history -- and sociological and economic research is but contemporary history. Evaluate your sources, if you are not to be misled -- and, in your turn, mislead.

2. Similarly, we must be cautious with statistical sources. When we look at figures we have to ask ourselves a number of questions. For what purpose were they originally collected, and with what degree of accuracy were they reported? Estimates of the costs of a project could err in a number of directions. People without much understanding of accountancy might not include all the costs of an undertaking -- or they might include too many. They might wish to convince somebody that the costs of a project were too great for it successfully to be undertaken, or alternatively that the costs were less than they were in fact so that it would be repeated elsewhere. It is necessary to begin any statistical evaluation of the new media with this degree of caution in mind because projects in the new media are not undertaken primarily with the interests of accountants and economists in mind. The projects are undertaken (and they tend to be costed) in hopeful anticipation -- and they are occasionally evaluated in rueful retrospect. Often they are undertaken by enthusiasts who have an interest in presenting the data in as favourable a light as possible. On the other hand, opponents of the new media may seek to put the material in as unfavourable a light as possible and, consciously or

unconsciously, doctor the data in a denigratory fashion. Therefore, when we collect information on the cost of undertaking education through the new media, we have to be at least as cautious as the trained historian or economist would be in interpreting any material which came into his hands -- and, indeed, we probably have to be doubly cautious because we know that there is likely to be systematic misrepresentation of the material. Misrepresentation doubtless with the very best of motives on either side, but misrepresentation nevertheless.

(2) Comparing the incomparable

3. That is the first note of caution. The second note of caution is of a different kind. Usually when we undertake costing of any projects it is in order to see whether one or other course of action is the cheaper. If we wish to travel from Paris to New York and we could go by two different routes -- sea and air -- we will ask our travel agent to obtain estimates of the fares going by different routes. If we wish to have a house built, we will ask for estimates from two or more builders and, other things being equal, we would normally choose the cheaper. But when we compare ordinary means of education with education conducted through the new media, we are only occasionally and almost by accident comparing like with like. For the greater part, the new media allow things to be done which could not normally be done by more orthodox means. This is indeed the primary purpose of adopting a new medium of instruction. Therefore, a straight comparison between the cost of an education programme of

an orthodox kind and one of an unorthodox kind is not possible. This is a fairly common situation both in business and in the public service. A businessman only occasionally has a situation where he may compare two identical products achieved by different means of production. More usually he is faced with the problem of costing a product somewhat different from the product he has previously made, produced by new methods, to compare with the costs of production of older products, produced by somewhat older machines. He has to make allowances for these differences. Similarly, the Defence Department rarely has two exactly identical aircraft to choose from, produced by different aircraft corporations to fulfill the same function. Usually the responsible official has to choose between different types of aircraft which perform somewhat different tasks. He has to weigh up the advantages of undertaking one kind of task rather than the other and he uses his cost estimates as part of the basis of his comparison. Therefore, when we seek to cost the new media for comparative purposes we are in the fairly common situation of public administrators and businessmen of choosing between what is in strict terms incomparable. The element of judgement, of decision-making in the light of all the circumstances, economic, social, pedagogic and cultural, is still with us.

4. In addition, we have the fact that the material on the costs of the new media will be available not because we want it for our limited purposes of research, but because it has been thrown up in the course of some quite different activity. Usually the cost-

accounting of the new media will have been undertaken by different people at different stages of the processes of production. The development of a school television system, for example, may have been the responsibility of one agency, the production of the programmes of another agency, and the installation of the television receivers, of yet a third agency. The purpose of keeping accounts is normally to prevent overspending and peculation through the use of budgetary controls and auditing procedures. It is not to provide easily assimilable material for cost accounting purposes. Therefore, by far the greatest amount of the data that we shall be dealing with will be rough and ready and not available in a form that allows strictly comparable exercises to be undertaken. The greater part of our work on the costs of the new media will be concerned with making estimates of one kind and another, and adjusting the crude data to suit our definitions. It is with these warnings in mind that the analytical part of this paper must be read. The cost statistics that we present will not be capable of being manipulated with any close degree of precision because the margins of error (resulting from the circumstances of their collection and subsequent adjustment) will be considerable, and consequently the results of our investigations will be open to attack unless they are presented with every possible degree of caution as to the uses of which they may legitimately be put.

II. THE PURPOSE OF COLLECTING COST DATA

(1) What questions do we wish to answer?

5. At this point we need to ask ourselves a leading question: what is the main purpose of the work on cost comparisons? Nothing is easier than to amass data on an unselective basis; by asking some key questions now we can be more selective in our data collection. First of all, we want to be able to make comparisons between different forms of education on a basis which makes the comparison as legitimate as possible. Otherwise we are likely persistently to find ourselves comparing incommensurable units. This means that (1) attention must be paid at all times to the need to standardize the units of account. Next, (2) we have to make sure that all costs have been included. Thirdly, we have to reduce the costs to a common monetary denominator. (This of course raises special problems in terms of international comparisons, because the choice of which exchange rate is particularly appropriate to the situation is a tricky matter.)

(6.) We must emphasize that the costing of conventional educational programmes is itself in most developing countries in a fairly rudimentary state and it therefore follows that we are likely to have fairly unsophisticated data on conventional methods of teaching from the developing countries.

7. The second purpose of the costing exercise is to determine the economically optimum rate of technical change in education. Hitherto education has changed in response to pedagogical and social forces and, in conditions of great scarcity we would wish increasingly

to see choices determined in a context where account has been taken of economic criteria. To put this point in a technical way, we are approaching a common business problem. When does it pay an enterprise to install the technically most up-to-date machinery?

8. This leads on to the third main purpose of the costing procedure. This is to give administrators the tools with which to devise incentives for the people operating the education system, to choose the most economical and effective course of action when a choice is open to them. This means that the data we present must be capable of fairly simple interpretation to a nontechnical audience.

(2) <u>What costs do we identify</u>?

9. That then is the purpose. What are the elements of the cost situation that we should seek to identify? We must remember what the broad context of the exercise is in the last analysis. It is to change the education system in the direction which minimizes the use of the scarcest resources. In a perfectly competitive economy, cash flows would identify these scarcities since the marginal utility of money would be equal to the marginal utility of all goods and services. But in the real world, and especially in the underdeveloped countries, this is not the case; the market is extremely imperfect. Further, the greater part of the expenditure that we are interested in is concerned with public expenditure, which is not susceptible to market criteria for its allocation. We have, therefore, at least six separate ways in which we could categorize the cost of an education system. The first is on the basis of cash. This would

include all outgoings, public and private, and would have to include national cash totals for those outlays which were made in kind, but which in fact did not enter into the cash nexus. (This, incidentally, includes the yield of capital through time, a problem considered below in some detail.) The second heading is the budget, or more properly speaking, the fiscal resources of the country in question. These again may not be easy to identify since they may fall under many headings. The third category is manpower. How much of the labour force is used by the various parts of the education system? The fourth heading would be concerned with a particular scarcity in this field -- the use of skilled manpower. For example, if mathematicians were particularly scarce, then you might cost an education system using as your units of account the number of mathematicians available. The fifth category would be the use of capital resources of all kinds. This is an important sector as control of the capital budget is often the major weapon employed by the planning authorities for making overall strategic economic decisions. The sixth category would be the use of foreign exchange for imported goods and services. If this is the greatest scarcity in the economy, then the aim of the accounting system should be to enable people to make decisions which permit them to economize in this particular resource.

10. We see, then, that the aim of the categorization of costs outlined here should be to identify the scarcest resources in order that they may be economized in, so that conceptually, although no doubt the greater part of our data would be in cash terms, it would

be wise to seek indications of costs under the other headings, even if they can only be spelt out in vague terms in words, rather than in accurate quantities.

III. A TABULATION OF COSTS

(1) Circumstances alter cases

11. This categorization of costs will be enumerated later at greater length in the appendix, where tables have been set out as guidelines. It has been set out here to draw attention to the fact that the conception of cost which is used in calculating the economic burden of a new medium of education varies according to the circumstances of the situation in which the medium is to be introduced. It also draws attention to the fact that the simple collection of data in terms of local currency, and its translation into dollar terms will not be a sufficient contribution to this part of the research enterprise. If substantial policy guidance is to be given to planners who are considering the introduction of new media into their school or higher education systems, it will be necessary to give indications under all of the relevant headings just mentioned of the nature of the economic costs of the new medium of education. This follows from the relaxation of the assumption of perfect competition, and perfect substitutability of factors which would underlie the use of money as the only indicator of the costs involved. It will be necessary to establish "rates of exchange" from each set of costs into cash; usually these should be a range -- what is commonly called "sensitivity analysis" is implicit in this analysis.

(2) The data required

12. Let us now consider the scope of the data which will be needed in order to evaluate the true costs of an innovation. Obviously these data will vary according to the nature of the innovation which is to be introduced: the costing procedures recommended for an educational television system would not be the same as those which would be adopted to cost a programme of teaching machines. Nevertheless, the new media for the most part have certain common characteristics from a cost point of view which differentiate them from those of conventional education costs, and it may be worthwhile at this stage of the paper to spell out some of them.

(3) Innovation costs

13. In the first place, the innovatory and experimental costs of developing the new medium have to be considered. Schools are built and teachers are recruited all over the world for education as it is commonly conducted without very much experimental preparation, but this is not the case for such matters as radio and correspondence courses, television programmes, teaching machines, films and other devices of this kind. In most cases a considerable period of developmental work has been undertaken -- development both in terms of developing the instruments which are to be used and also in developing the programmes which the capital equipment transmits and receives. Our first heading, therefore, will be development costs. Obviously in the case of many new media the greater part of the initial development costs have already been borne by the agencies

in the developed countries, or other developing nations, where these innovations have been initially introduced, but there are in addition costs of adaptation to the new circumstances in which these media will be used in the developing nations which should be calculated.

(4) Training costs

14. The second major cost is in preparing the members of the school system -- administrators, teachers, and in some cases, the students themselves -- to make use of the new educational medium. In many cases there will be a considerable expenditure on training, preparation and in work shops designed to create the psychological readiness to accept innovations. It may also be necessary to train technicians and others to work the technical apparatus which is used by the new medium. In the extreme cases, for example, of the introduction of a new television system purely for educational purposes, the entire cost of training a production team for a television station would need to be included.

(5) Course materials

15. Thirdly, there is the cost of preparing the material which is to be used by the new medium. Again, for numerous programmes this material may be available already in one of the developed nations (or in another developing nation) which has already introduced the innovation in question. But, for the greater part, the new media are only effective when they are using material which has been specifically designed for the situation in which it is to be used. Consequently these costs will usually be significant matter.

(6) Costs of equipment for transmission and reception

16. The next item of costs to consider is that of providing the capital equipment necessary for the programme. This consists of equipment for transmitting the material and equipment for receiving the material. In the case of television these costs are high in both cases, whereas in the case of a correspondence course the costs are negligible at the receiving end. Nevertheless, for the sake of easy comparability it is necessary to complete the returns even if the items enumerated are nil or negligible.

17. It is particularly important in this connection to see that all costs are included. For example, the adaptation of buildings to receive the new plant and equipment which is necessary both for transmission and reception is often a serious consideration in countries where elaborate modern buildings are scarce and expensive.

(7) Recurrent costs

18. We turn now to recurrent costs. These include labour costs -- and labour includes the labour of teachers, labour of other skilled workers such as television producers, mechanics and so on, and unskilled labour. In addition other costs such as electricity, materials, transport costs and so on, need to be enumerated.

(8) The procedures

19. This tabulation should provide a fairly complete enumeration of the costs involved in television or other programmes in a new medium. It will be seen that it enables us to draw attention to the nature of the costs involved -- whether they are skilled labour,

capital, foreign exchange, or local currency. (We will return later to the question of a common exchange rate.)

IV. TIME AND CAPITAL

(1) A conundrum

20. The tabulation has been set out in this matter without referring to the period over which the costing is to be considered. Some of the items involved are a once-for-all payment such as that involved in initial development. Others, such as capital equipment, yield their benefits over long periods. Others are recurrent costs which recur in any period in which the equipment is used. From the point of view of the costing programme it is important to collect all the data regardless of the period to which it relates. The crucial point is to make sure that all costs -- direct and indirect -- have been included, in so far as this is possible. After the data have been collected, however, the analysis has to be undertaken. Costs have to be divided into initial costs, capital costs, and recurrent costs.

21. The question which we now approach is the question of the time period. If we look at the dominating economic characteristic of the new media, one point immediately strikes us. They are much more capital intensive than the equivalent procedures in the prevailing education system. This means that the problem of time is a crucial one in interpreting their economics. This brings us face to face with the standard problems -- but no easier for being standard -- of interest, depreciation, obsolescence and amortization. It is

well known that there is no uniformly satisfactory solution to the central issue posed by questions involving these aspects of costs. There is no ideal formula which can be used for the simple reason that the standards which are applicable vary according to the economic circumstances of the time and place. Nevertheless, it is important that a uniform criterion should be adopted as to the principles which should be applied (under each of these headings) in this research project. In what follows, an inevitably tentative approach is adopted and experience will show us whether or not these initial suggestions will need substantial modification. But one general preliminary point needs to be made. It is probably worthwhile to err on the side of excessive caution rather than to be optimistic about the likely orders of magnitude of the costs involved. After all, we are analysts, not advocators.

(2) A tentative approach

22. The first question that has to be assessed is a simple one on the face of it: How long is the capital equipment likely to last? How soon will it have to be replaced because of obsolescence, or because of physical depreciation? Upon our answer to the last question depends whether we ought to adopt a straight-line write-off procedure, whether a great deal ought to be written off in the early years, or whether we ought to depreciate a small amount initially, and use heavily in the later years. To answer these questions we need technical data both about the physical life of capital equipment, and about the likely rate of development of new techniques which will supersede those now being adopted.

23. We also must charge an interest payment, even if the interest is notional and not actual, as explained below. Consequently, the period of time which we adopt for the amortization of capital equipment is going to be the basis of our analysis. Therefore, it is in this connection that a great deal of hard factual evidence needs to be accumulated. It is likely, for example, that capital equipment will receive rougher treatment in a developing country than it does in a developed country. On the other hand, it is probable that the rate of obsolescence will be very much lower in a poor country than in a rich country because the rate of adoption of the latest idea will be lower. But we must also remember, that the rate of interest is likely to be much higher in a poor country than in a rich country. All these considerations have to be weighed up. Consequently the suggestion which is put forward here is that the equipment should be dealt with under each of the headings above -- interest, depreciation and obsolescence -- and that a procedure should be adopted which provides for a range of amortization rates and interest rates for any piece of capital equipment.

24. The importance of the calculations under this heading follows from the fact that the greater part of the costs of many of the new procedures are likely to fall under the heading of capital costs. Even if the procedures which we are recommending are unfamiliar to the average Educational Administrator, they are an essential part of an analysis -- for in the developing countries capital is extremely scarce and the costs involved in devoting capital equipment

to education are the opportunities foregone in using these resources in other possible developments in other sectors of the economy, such as industry, agriculture, transport and the social services. The one thing which stands out from this analysis is that the discount rates appropriate to a developed country will not be appropriate to an underdeveloped country. (It is for this reason that a range of rates has been suggested.)

Perhaps the best procedure would be to take the calculations of discount rates on various assumptions to an economic planner in one of the developing nations and see whether the orders of magnitude involved make sense to him in the light of the knowledge he has about the general economic situation in his country.

V. OTHER SERIOUS PROBLEMS

(1) The long-run trend of costs

25. The question which has to be faced in this section of the analysis of costs is that of the trend of costs. The likelihood is that the costs of teaching by conventional methods will tend to rise through time, mainly because the greater part of conventional teaching costs are teachers' salaries. Teachers' salaries are likely to improve as economic and social development takes place, and their qualifications, on which their salaries are based, are also likely to improve. It therefore follows that when we have relatively long-lived equipment like a radio or TV station which is being installed, then the trend of costs should also be studied as well as the likely costs at the time of installation.

The recurrent costs of teaching by the new media are likely to fall as familiarity with the new procedures spreads throughout the education system. In addition, there may well be substantial economies of scale in the use of the new media, particularly in the training of people who operate the new media. There is some evidence, too, that the capital costs of installations for transmission and reception have been falling as technical progress takes place. In short, we need to have some indication of the shape of the long-run cost curve as well as an indication of the shape of the short-run cost curve.

(2) Joint costs

26. We now approach a major issue that has to be considered in this context: the problem of joint costs. It has already been said that the analyst of this information should be concerned to be sure that all direct and indirect costs have been included under the different headings which have been enumerated, but it will be apparent that in a number of cases these costs are joint costs which are shared by a number of enterprises. For example a television station may transmit ordinary television programmes and education programmes; a radio station may do the same. This is a familiar economic problem and the solution to it is to identify one product as a by-product. That is to say, the enterprise is initiated for a particular purpose and as a bonus, as it were, other benefits accrue to the entrepreneur from the sale of the second commodity. In theory, the maximization of total revenue is achieved by charging prices that relate to the demand conditions in the two markets. Now, in a number of cases

education is a by-product of the ordinary operation of the mass media. There are usually additional costs which are identifiable: those running costs which are associated with the educational service itself, for instance, but the major part of the capital installation for transmission would be there whether there were an education service or not. It would, therefore, be quite invalid to attribute part of the overhead costs to the educational service if they would have been borne in any case.

This illustrates a general economic problem that the only costs we are interested in are costs which are escapable: that is to say, costs which would not arise if we did not undertake this particular operation.

(3) Other problems -- the product

27. There are two additional problems which we ought to consider, but which should be left until after the work on costs has been completed, since it is logically separate. The first is whether or not the effectiveness of the new media is as great as that of the other media. We may take as our basis the assurance by the experts on pedagogical problems that the new medium at least was no less effective than the medium which was formerly in use. But the second problem arises when we are facing a situation where the new media can do something that could not be done before.

It would seem advisable for us to analyse the costs of the operation of a new educational medium, and then present these data to the policymakers. All policymakers have to face at some stage a choice

between completely different objectives given limited resources, and we can only attempt to analyse the costs of the procedures we are interested in and give some indication of some of the kinds of benefits -- qualitative and quantitative -- which might be expected from it.

APPENDIX TO PAPER "COSTS OF NEW MEDIA"

STEP I — A CHART OF COSTS OF THE NEW MEDIA

This chart is concerned with total costs. It will be used as a basis for costs per year (or other period) and costs per unit (school, class or pupil).

	(1) Cost in local currency	(2) Equivalent (at appropriate exchange rate)	(3) Capital cost	(4) Recurrent cost	(5) Foreign exchange component	(6) Labour force	(7) Type & No. of skilled workers
A. Experiment and Development a.equipment b.course content c.training							
B. Fixed capital equipment -- transmission							
C. Fixed capital -- reception							
D. Recurrent expenditure transmission a.Labour b.Materials c.Other							
E. Recurrent expenditure reception a.Labour b.Materials c.Other							
F. Interest payments (actual or notional)							
TOTAL							

STEP II

After these calculations, spell out in words and figures the following:

Specify units of transmission (i.e., number of TV productions, number of films, etc.) in columns D and E;

Specify interest rate assumed, column F;

Specify rate of amortization of capital, spelling out depreciation & obsolescence, for columns 3, and B and C;

Indicate joint costs of transmission & reception, and whether the educational purpose is the main one (this is to adjust colums 3, B and C);

Specify size of audience, to get unit costs;

Specify reason for adoption of the use of the exchange rate in column 2.

STEP III

Using the data presented above we can now present various kinds of unit costs in different kinds of cost situations (e.g., local currency, capital, foreign exchange, etc.). We should also be able to present (1) an indication of the economies of scale as the system develops, and (2) the trend of costs over time, as development work proceeds. We therefore need to have an idea of the date of different installations, and the costs -- standardized for price levels -- over time as new installations were created.